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(d) *Vertical Distance of Grate Bars below the Hearth of the Furnace.*—This distance must be sufficient to impress the desired velocities upon the gases in the different portions of the furnace and firebox.

Starting with the passage of the air through the ash pit, the volume of air required is

$$8.71 \times 1.60 \times 0.036 = 0.501 \text{ per second.}$$

In order to secure a velocity of 0.50 per second in the ash pit this pit must be given an area of $1 \text{ m}^2 \times 0.50 = 2 \text{ m}^2$.

To impress a velocity $V_i = 0.50$ per second upon the air, a velocity head $h_i = 0.127$ is required, neglecting friction, from which

$$5i = 1.29 \times 0.127 = 0.16 \text{ of water.}$$

The total free area between the grate bars is equal to

$$\frac{1 \text{ m}^2}{0.50} = 0.60 \text{ m}^2.$$

The velocity of the air passing through the grate will be

$$0.501 : 0.60 = 0.835 \text{ per second,}$$

from which $f_e = 0.036$ and

$$B_2 = 1.29 \times 0.36 = 0.46 \text{ of water column.}$$

Resistance of the Fuel Bed.—It is assumed that the depth of the bed of burning coal upon the grate has a thickness of 150 mm and that it is formed of three layers or tiers of coal in small pieces, each layer having a thickness of 50 mm; therefore in passing through the fuel bed the air will lose its velocity three times.

The velocity head required to impress upon the air the velocity with which it passes through each layer or tier of the fuel will be the resistance offered by that tier to the passage of the air, and the total resistance of the bed of fuel upon the grate will be

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^ Velocity heads required, refer to Appendix III.